

The 1st International Workshop on Internet of Things Applications (IOT-App)



Beijing, China April 16, 2012

<http://www.ece.rutgers.edu/~yyzhang/iotapp>
To be held in conjunction with the CPSweek 2012

ADVANCE PROGRAM

- 8:30 – 8:45 **Welcoming Remarks**
- 8:45 – 9:30 **Keynote Address**
Intelligent Modules for Building Internet-of-Things – Enabling Seamless Cyber-Physical Interactions
Fred Xiaofan Jiang (Microsoft Research Asia)
- 9:30 – 10:00 **Invited Talk**
From Forest to City: Lessons Learned from GreenOrbs
Yuan He (Tsinghua University)
- 10:00 – 10:30 **Break**
- Session 1: IOT Applications**
- 10:30 – 11:00 *A Real-Time Data-Driven Travel Time Estimator*
Ayaka Koshibe, Sangeetha Siddegowda, Bernhard Firner (Rutgers University)
- 11:00 – 11:30 *A Survey on Agricultural Applications of Wireless Sensor Networks: Towards Internet of Things*
Siyu Li and Hongju Gao (China Agricultural University)
- 11:30 – noon *Improving Quality of Life of Differently-abled Persons using Body based Sensors*
Prabhat Ranjan (DA-IICT)
- Noon – 13:15 **Lunch**
- 13:15 – 14:00 **Keynote Address**
Unified Middleware for IoT Applications
Hongbo Zhou (Foton)
- 14:00 – 14:30 **invited talk**
SensorFly and Beyond: From Flying Sensor Swarms to Internet of Things
Pei Zhang (Carnegie Mellon University)
- 14:30 – 15:00 **break**
- Session 2: Monitoring, Middleware and Management**
- 15:00 – 15:30 *Group Enabled Spatial Dissemination in Mobile Social Networks*
Na Yu and Qi Han (Colorado School of Mines)
- 15:30 – 16:00 *New Spectrum Allocation for Heterogeneous Wireless Systems of the Internet of Things*
Kaigui Bian, Yang Tian, and Xiaoming Li (Peking University)
- 16:00 – 16:30 *WSN Design and Integration for the Supporting System of Power Transformer Substations*
Miaolong Hu (WINS Wireless Network Technology Inc.) and Jun Li (Rutgers University)
- 16:30 – 16:00 *Empirical Mode Decomposition for Intrinsic-Relationship Extraction in Large Sensor Deployments*
Romain Fontugne (Univ. of Tokyo), Jorge Ortiz, David Culler (UC Berkeley), Hiroshi Esaki (Univ. of Tokyo)
- 17:00 – 17:15 **Closing Remarks**

Keynote Address I

Intelligent Modules for Building Internet-of-Things – Enabling Seamless Cyber-Physical Interactions

Speaker: Fred Xiaofan Jiang

Abstract- “Internet of Things” is a term that has gained popularity in recent years, yet it is unclear that IoT really means, and what it can bring us. In some industries, IoT has already degenerated into a synonym for RFID. But to us, IoT is much more than ubiquitous RFID or adding networking interface to everything. Instead, it is about enabling intelligent and seamless interactions between humans, the physical world, and services in the cloud. In this talk, I will focus the architecture, system design, and applications of Pulse – an IoT themed research project at Microsoft Research Asia. Pulse is a platform that brings together physical sensors, actuators, and virtual services in the cloud to enable humans to easily program their environment and embed intelligence in everyday objects. Pulse consists of several components – an uniform interface for representing physical and virtual services, a precise proximity detection service to facilitate physical interactions, and an user interface for composing modules. In addition, I will highlight several applications built on top of this platform, including context-aware advertisement, smart offices, indoor tracking, and fine-grain energy footprinting.

Biography – Dr. Xiaofan Fred Jiang is a researcher in the Mobile and Sensing Systems Group at Microsoft Research Asia. His primary research interests include mobile and embedded systems, wireless sensor networks, energy monitoring and control, and distributed systems. His current projects include mobile wellness monitoring, context-aware social networks, indoor locations, and building energy monitoring.

He received his B.S., M.S., and Ph.D. in Computer Science from U.C. Berkeley, advised by Professor David Culler. His dissertation research is on using wireless sensor networks for energy monitoring and reduction in buildings. His ACme platform has been widely adopted by universities and industries, including Lawrence Berkeley National Laboratory, Stanford University, and several startups. Before joining MSRA, he has worked in Google, Intel, Xilinx, Arch Rock (now part of Cisco), and People Power.

Invited Talk I

From Forest to City: Lessons Learned from GreenOrbs

Speaker: Yuan He

Abstract – The world has just ten years to bring greenhouse gas emissions under control before the damage they cause becomes irreversible. The 2009 Climate Conference in Copenhagen draws world-wide attention. Global climate change causes a series of damage to the earth environment, such as global warming, glacier melting, sea level rise, and extreme weather events. It posed increasingly severe threats to the subsistence of human beings and the sustainable development of human society. Under such circumstances, GreenOrbs is launched. The information GreenOrbs offers can be used as evidences, references, and scientific tools for human beings in the battle against global climate changes and environmental pollution. Our research group has carried out fruitful research and system work in the interdisciplinary area for applying WSN technique to forestry and urban sensing fields. We have deployed two large-scale WSN systems since 2009. In total more than 2000 nodes have been deployed in GreenOrbs and the climax scale of GreenOrbs includes 500 nodes. As the extension of GreenOrbs into the urban sensing area, CitySee has deployed 1200 nodes and covers 1.12 km² urban areas. We learned a lot of lessons during the deployment of GreenOrbs. This experiment results in several publications, including ACM Sensys 2009, 2010, ACM Sigmetrics 2010, ICNP 2010, INFOCOM 2010-2012, etc. In this discussion, we will focus on several open issues for extremely large scale deployment of sensor networks including routing, diagnosis, localization, link quality, and etc.

Biography – Dr. Yuan He received his BE degree in University of Science and Technology of China in 2003, his ME degree in Institute of Software, Chinese Academy of Sciences in 2006, and his PhD degree in Hong Kong University of Science and Technology. His research interests include sensor networks, peer-to-peer computing, and pervasive computing. He has published over 40 technical papers in the above area and received the best paper award of IEEE ICPADS 2010. He is the team leader of GreenOrbs, who coordinates the system design, implementation, and deployments of GreenOrbs since 2009. He now works with Prof. Yunhao Liu as a member of Tsinghua National Lab for Information Science and Technology.

Keynote Address II *Unified Middleware for IoT Applications*

Speaker: Honbo Zhou

Abstract- Internet of Things applications are not new and can be found in all industrial fields. A four-pillar categorization is introduced for IoT applications based on their common characteristics such as technological origin, business background, and market value chain. IoT is about connectivity and integration, Middleware plays a crucial role for IoT applications, Middleware for all 4 pillar IoT categories are summarized in this presentation. A common IoT middleware architecture is proposed based on the speaker's many years of industrial practices on building middleware products (the ezM2M IoT platform) for a variety of IoT applications as well as new developments in IoT standardization and cloud computing paradigms. Most of the contents of this presentation are from the speaker's new IoT book to be published by Taylor & Francis group soon.

Biography – Dr. Honbo Zhou is currently CEO of Foton Telematics Co. Ltd. He was Chief Software Scientist of TongFang Co. Ltd., Executive Director of Board and CTO of Technovator Pte. Ltd., COO of TongFang Software Co. Ltd. He worked as research scientist at Oak Ridge National Lab after receiving his Ph.D. in computer science from University of Zurich in 1993. He also worked at IBM, BEA (Now Oracle) and other companies in US as senior engineers or managers before returning to China. He participated in the ASCI-Blue Pacific project of building the world's fastest supercomputer in 1996 while at IBM as a software team lead. He built a cloud computing system that accomplished the complete annotation of Human Genome for the first time in the world, which was reported by media such as CNN and San Francisco Chronicle. He has been one of the pioneers on Internet of things and M2M in China since 2003 and author of three related books (one in US). He is the chief architect of TongFang's flagship ezM2M Middleware Platform for IoT applications. He is adjunct professors of several universities and VP of a few professional associations in China.

Invited Talk II *SensorFly and Beyond: From Flying Sensor Swarms to Internet of Things*

Speaker: Pei Zhang

Abstract – As Internet-of-things become more common place in the consumer landscape, setup of such systems become an important problem. The talk will explore this problem through SensorFly. The SensorFly system is a novel, low-cost, miniature controlled-mobile aerial sensor network weighing only 30 grams each. This limits the capability of each device but permits the exploration of network to be autonomous in deployment, maintenance and adapting to the environment.

The main focus of the talk will be on the PANDAA and POLARIOUS system. An autonomous setup method for SensorFly to obtain physical orientation of devices using ambient sound and visual context. Not only for SensorFly, the system through existing context can achieve accurate location and orientation information in a broad spectrum of indoor applications.

Biography – Pei Zhang is an assistant research professor in the INI, and ECE departments at Carnegie Mellon University. He received his Bachelor's degree with honors from California Institute of Technology in 2002, and his Ph.D. degree in Electrical Engineering from Princeton University in 2008. While at Princeton University, he developed the ZebraNet system, which is used to track zebras in Kenya. It was the first deployed, wireless, ad-hoc, mobile sensor network. Currently his work includes SensorFly, which focus on groups of autonomous miniature-helicopter based sensor nodes. His primary research interest is in easing setup and functionality of ubiquitous embedded systems through inter/intra system collaboration.